

L 45583-66

ACC NR: AP6031516

water and HCl but decomposed completely by heating in oxidizing reagents, e.g., concentrated  $H_2SO_4$ ,  $HNO_3$ ,  $H_2O_2$ .  $TaS_2$  was resistant to oxidation in an oxygen stream up to 300C. In oxygen at 500C,  $TaS_2$  was completely oxidized to tantalum pentoxide and sulfur dioxide. Orig. art. has: 3 tables and 2 figures. [JK]

SUB CODE: 07/ SUBM DATE: 20Mar65/ ORIG REF: 001/ OTH REF: 004  
ATD PRESS: 5082

Card 2/2 LC

BUKHAN'KO, Nikolay Ivanovich; MARTSEVICH, Yu.P., red. izd-va; KOZLENKOVA, Ye.I., tekhn. red.

[It deserves praise and imitation; public food service on state farms of the Altai Territory] Zasluzhivaet pokhvaly i podrazhaniya; obshchestvennoe pitanie v sovkhozakh Altaiskogo kraia. Moskva, Izd-vo TSentrosoiuza, 1960. 37 p. (MIRA 14:10)

1. Sekretar' Altayskogo krayevogo komiteta Kommunisticheskoy partii Sovetskogo Soyuza (for Bukhan'ko).

(Altai Territory—Restaurants, lunchrooms, etc.)

(Altai Territory—State farms)

BUKHAN'KO, Nikolay Nikolayevich, Geroy Sotsialisticheskogo Truda;  
MONOVA, Ye.S., red.; TRUKHINA, O.N., tekhn. red.

[The "Strana Sovetov" Collective Farm along new paths] Kol-  
khoz "Strana Sovetov" na novykh putiakh. Moskva, Sel'khoz-  
izdat, 1962. 86 p. (MIRA 16:2)

1. Predsedatel' kolkhoza "Strana Sovetov". Altay (for Bukhan'ko).  
(Altai Territory--Agriculture)

BUKHAN'KO, N.N.; SNASTIN, M.A., agronom

Results from high standards of agriculture in the Siberian virgin  
lands. Zemledelie 23 no.11:25-29 N '61. (MIRA 14:12)

1. Predsedatel' kolkhoza "Strana Sovetov" Rubtsovskogo rayona,  
Altayskogo kraya (for Bukhan'ko).  
(Siberia--Agriculture)

KALIBERDA, V.M., kand. sel'skokhoz. nauk; SULIMOVSKIY, I.G., kand. sel'skokhoz. nauk; BUKHAN'KO, Ye.P.; LOGVINENKO, V.A., agronom; KOVALENKO, A.P.; PODGORNYY, P.I., prof. zasluzhennyy deyatel' nauki Ukrainskoy SSR; FEDOTOV, V.A., aspirant; KURBATOV, I.D., agronom; KOZEYEV, V.I.; SHCHETININ, A.I.; KORCHAGIN, V.A., kand. sel'skokhoz. nauk; SOGURENKO, V.P.; KOSTROV, K.A., kand. sel'skokhoz. nauk; DULYA, F.M.; SHERSTNEV, N.F., aspirant

Crops preceding winter crops in various zones. Zemledelie 27 no.7:  
26-45 J1 '65. (MIRA 18:7)

1. Ukrainskaya sel'skokhozyaystvennaya akademiya (for Kaliberda).
2. Odesskiy sel'skokhozyaystvennyy institut (for Sulimovskiy).
3. Odesskaya oblastnaya sel'skokhozyaystvennaya opytnaya stantsiya (for Bukhan'ko).
4. Kolkhoz imeni Kirova, Mar'inskogo rayona Donetskoy oblasti (for Logvinenko).
5. Donetskaya oblastnaya sel'skokhozyaystvennaya opytnaya stantsiya (for Kovalenko).
6. Voronezhskiy sel'skokhozyaystvennyy institut (for Fedotov).
7. Alekseyevskoye rayonnoye proizvodstvennoye upravleniye sel'skogo khozyaystva, Belgorodskoy oblasti (for Kurbatov).
8. Bezenchukskaya sel'skokhozyaystvennaya opytnaya stantsiya (for Korchagin).
9. Direktor Bykovskoy opytnoy stantsii bakhchevodstva (for Sogurenko).
10. Mordovskaya sel'skokhozyaystvennaya opytnaya stantsiya (for Kostrov).
11. Direktor sovkhoza "Khleborobnyy", Smolenskogo rayona, Altayskogo kraya (for Dulya).
12. Altayskiy sel'skokhozyaystvennyy institut (for Sherstnev).

BUKHANOV, G.N. (Moskva)

Teachers of mathematics learn about production. Mat. v shkole  
no.2:16-19 Mr-Apr '61. . (MIRA 14:4)  
(Mathematics—Study and teaching)

BOGUSHEVSKIY, Konstantin Sergeyevich, zasl. uchitel' shkoly RSFSR;  
PAVLENKO, I.A., zasl. uchitel' shkoly RSFSR, retsenzent;  
BUKHANOV, G.N., retsenzent; UMANSKIY, G.S., red.

[Problems of teaching geometry in eight-year schools;  
manual for teachers] Voprosy prepodovaniia geometrii v  
vos'miletnei shkole; posobie dlia uchitelei. Moskva, Izd-  
vo "Prosveshchenie," 1964. 109 p. (MIRA 17:6)

БУХАНОВ И. Г.

БУХАНОВ И. Г., СОЛОВЬЕВА Л. А.

Uselenie rodovoi deistelnosti syverotkoi platsentarnoi  
krovi. //Acceleration of labor by means of serum of  
placental blood/ Sovet. med. No. 3 Mar 50 p. 25-6.

1. Of the Obstetric-Gynecological Clinic, Omsk Medical  
Institute imeni M. I. Kalinin (Director -- Prof. Ya. G.  
Bukhanov).

CIML Vol. 19, No. 2 Aug. 1950



BUKHANOV, M.

Ufa. Na stroi.Ros. no.1:37 Ja '61.  
(Ufa—Construction industry)

(MIRA 14:6)

BUKHANOV, M.

Rated as "excellent." Na stroi. Ros. no. 12:5 D '61.  
(Oktyabr'skiy (Bashkiria)—Building) (MIRA 16:1)

BUKHANOV, M.S.; YURKEVICH, M.P.; NEZDYUROV, D.F., professor, redaktor

[M.A.Rykachev, outstanding scientist in meteorology and aeronautics]  
M.A.Rykachev - vydaiushchiisia deiatel' meteorologii i vozdukhoplava-  
niia. Leningrad, Gidrometeorologicheskoe izd-vo, 1954. 49 p. (MLRA 7:9)  
(Rykachev, Mikhail Aleksandrovich, 1840-1919)

*Butcher, Nikolai Stepanovich*

BUKHANOV, Mikhail Stepanovich; GRIGOR'YEVA, A.I., red.; GERASIMOVA, V.N.,  
tekhn.red.

[Aleksandr Klubov, Soviet flyer; a biography] Aleksandr Klubov -  
sovetskii letchik; biograficheskii ocherk. Moskva, Izd-vo  
DOSAAF, 1957. 86 p. (MIRA 11:4)  
(Klubov, Aleksandr, 1919- )

MOROZOV, S.T.; BUKHAIKOV, V.F., redaktor; DOLGOPOLOV, I.V.; RAZUKIN,  
Ye.V., redaktor; RAZGOLYAYEVA, N.G., tekhnicheskii redaktor.

[In the center of the Arctic] V tsentre arktiki. Fotografii 1A.  
Riunkina. Moskva, Izd-vo Pravda, 1955. 81 p. (MLRA 8:11)  
(Arctic regions)

BUKHANOV. V. F.

B/4  
621.12  
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CHEREZ OKEAN NA DREYFUYUSHCHIKH L'DAKH (ACROSS AN OCEAN ON DRIFTING ICE)  
MOSKVA, GEOGRAFIZDAT, 1957. 379 p. ILLUS., MAPS.

BUKHANOV, Viktor

For successful education... Rabotnitsa 40 no.7:15-17 JI '62.

(Moscow—Libraries)

(MIRA 16:2)

BUKHANOV, V.M., SIROTENKO, I.G., YURASOVA, V.YE.

"On the peculiarities of the anisotropy of the monocrystal cathode sputtering."

Report submitted for the Colloquium on Ionic Bombardement  
National Center of Scientific Research, Bellevue 4-8 Dec 1961



YURASOVA, V.Ye.; BUKHANOV, V.M.

Anisotropy of cathode sputtering of a copper monocrystal as a  
function of its temperature. Kristallografiia 7 no.2:257-260  
Mr-Apr '62. (MIRA 15:4)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova.  
(Sputtering (Physics)) (Copper crystals--Thermal properties)

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1 2 3 4 5 6 7 8 9 10 11 12													13 14 15 16 17 18 19 20 21 22 23 24 25 26												
<div style="display: flex; justify-content: space-between;"> <span>BUKHANOV, YA. G.</span> <span>PROCESSES AND PROPERTIES INDEX</span> <span>11F</span> </div> <div style="text-align: center; margin-top: 100px;"> <p>The role of pituitrin-like substances in etiology of premature birth. Ya. G. Buxhanov. <i>Akusherstvo i Ginek.</i> 1946, No. 1, 18-22. —By use of the technique of comparing pituitrin activity of the blood with a standard sample of pituitrin P, it was shown that the former reaches a higher level in cases in which premature birth takes place than is reached in cases of normal pregnancy. The preventative treatment consisted of papaverine or analogous substances. G. M. Kosolajoff.</p> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span>ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION</span> <span>EXTRACT</span> </div>																									
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BUKHANOV, Ya.G., prof.; BABUSHKINA, V.T.

Use of placental blood in the prevention of blood loss in placental stage and early postpartum. Sov.med. 22 no.3:10-102 Mr '58.

(MIRA 11:4)

1. Iz kafedry akusherstva i ginekologii (zav. - prof. Ya.G. Bukhanov) Stalingradskogo meditsinskogo instituta.

(PLACENTA

placental blood, intramusc. inject. in prev. of postpartum blood loss (Rus))

(LABOR, hemorrh.

in 3rd state & postpartum, prev. with intramusc. inject. of placental blood (Rus))

BUKHANOV, Ya.G., prof.

Methodology of stimulation and promotion of labor activity in  
prolonged pregnancy. Vop. okhr. materin. det. 8 no.1:73-76'63  
(MIRA 17:2)

1. Iz kafedry akusherstva i ginekologii ( zav. - prof. Ya.G.  
Bukhanov) Volgogradskogo meditsinskogo instituta.

BUKHANOVA, A.A.

3.

M. A.

Study of the Forms of Primary Crystallization in Alloys. D. A. Petrov and A. A. Buxhanova (Invest. Akad. Nauk S.S.S.R., 1949, (Khiz.), (4), 396-409; C. Abs., 1950, 44, 895).--(In Russian). Experimental results agreed with Gibbs' condition,  $\sum \sigma_i / S_i = \text{minimum}$  for a const. vol., where  $\sigma_i$  is the surface energy of a crystal face and  $S_i$  is the surface area of the crystal face, and with Bravais's condition that the plane of closest packing grows fastest. The energy of atoms in a crystal was assumed greater the larger the unbalanced binding energy. The equilibrium crystal form in face-centered cubic crystals should be {111}. Although an evaporation method is possible, aluminium crystals were grown by cooling melts in the aluminium-tin system at 10-15°C./hr.; 99.7% aluminium and 99.5% tin were used. Crystals grown in 1-5% aluminium melts were found by metallographic examination of the solidified melt to be perfect octahedra; those grown in melts containing above 20% had oval cross-sections; intermediate compositions gave transition forms. Experiments on 99.5% lead-0.5% aluminium alloys gave perfect crystals at low temp. and oval forms at high temp. This temp. effect was found also in the formation of copper crystals from bismuth-copper and antimony crystals from lead-antimony alloys. The equilibrium form of silicon crystals was dodecahedral from tin-silicon melts. The reason for the formation of dendrites is the difference in binding energy of the atoms at various positions

Inst. Org. Chem., AS USSR

BUKHANOVA, A. A.

27744. BUKHANOVA, A. A. i PETROV, D. A.--izucheniye form sverkhney kristallizatsii  
metallov. trudy mosk. aviats. tekhnol. in-ta, vyp. 7, 1949, S. 3-19 -  
Bibliogr: 8 nazv.

SO: Ietopis' Zhurnal'nykh Sobyat, Vol. 37, 1949.

BUKHANOVA, A. A.

"Forms of Primary Crystallization of Certain Metals and Solid Solutions Based on These Metals." Thesis for degree of Cand. Technical Sci. Sub 15 Jun 50, Moscow Aviation Technological Inst.

Dissertations Presented for Degrees in Science and Engineering in Moscow in 1950.  
From Vechernyaya Moskva, Jan-Dec 1950.

*Bukhanova, A. A.*

USSR/Chemistry - Metallurgy

Card 1/1 Pub. 147 - 21/26

Authors : Petrov, D. A., and Bukhanova, A. A.

Title : New method of obtaining variable composition samples and the possibility of its application

Periodical : Zhur. fiz. Khim. 28/1, 161-173, Jan 1954

Abstract : A new method is introduced for the derivation of variable composition samples through the extraction of the solid phase from the smelt. The theory of the process is explained and the applicability of the above mentioned new method to Al alloys containing from 2 - 4% Cu was verified. Other applications of this method are: formation of solidus lines, solubility lines in solid state, determination of the nature of invariant, study of the phase composition of complex mixtures, etc. Two USSR references (1944 and 1947). Graphs; drawing; illustrations.

Institution : Academy of Sciences USSR, Institute of Metallurgy

Submitted : July 28, 1953



BUKHANOVA, A.A.

Category : USSR/Solid State Physics - Morphology of Crystals. Crystallization

E-7

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1267

Author : Petrov, D.Z., Bukhanova, A.A.

Title : New Fields of Application for The Phenomena Observed During Crystallization of Smelted Metals

Orig Pub : Alyuminiyevyye splavy. Lit'ye prokatka, kovka, shtampovka, termobrabotka. M., Oborongiz, 1955, 65-83

Abstract : The method of obtaining specimens with a continuously-varying composition from one end of the specimen to the other is briefly discussed. The process is based on the difference in composition of the adjacent liquid and solid phases of the substance during crystallization. The specimens were obtained by drawing out (using the Chokhralskiy method) the crystal from the smelt. Using Al-Cu specimens, obtained at various drawing speeds, the hardness and the micro-and macro-structure were measured along the specimen, after which the specimen was cut into parts 2 -- 4 mm long, and its chemical composition was determined. Curves are given for the distribution of copper along the specimen for alloys containing 2, 3, and 4% copper, at various drawing speeds. Forced stirring of the melt reduced to one-sixth the time required to produce

Card : 1/2

Category : USSR/Solid State Physics - Morphology of Crystals. Crystallization

E-7

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1267

a specimen of a composition close to the theoretical value. The author believes that the method for producing specimens of varying compositions can be used to plot the solidus line in the state diagram so as to determine the character of the non-variant reaction, to determine the solubility in the solid state, to remove impurities from metals, and to determine the phase composition of multi-component alloys.

Card : 2/2

PETROV, D. A. (Prof., Dr. Tech. Sci.) BUKHANOVA, A. A. (Cand. Tech. Sci.)

"Change in Shape and Recrystallization of Crystalline Substances During Solution and Growth in the Solid Phase" In book - Physical Metallurgy and Technology of Heat Treatment. Moscow. Oborongiz, 1958, 179 p.

~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

The authors investigate the changes in crystalline structure which occur during the annealing of various alloys.

18(7), 18(6)

AUTHORS:

Livanov, V. A., Bukhanova, A. A., ~~\_\_\_\_\_~~ SOV/163-58-4-44/47  
Kolachev, B. A.

TITLE:

Influence of Hydrogen on the Mechanical Properties of Titanium  
and its Alloys (Vliyanie vodoroda na mekhanicheskiye svoystva  
titana i yego splavov)

PERIODICAL:

Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 4,  
pp 248-254 (USSR)

ABSTRACT:

This investigation concerned the kinetics of the interaction  
of titanium and its alloys with hydrogen, as well as the  
influence of hydrogen on the mechanical properties of titanium  
and its alloys, using domestic technically pure titanium as  
starting material. For the time being, the investigation was  
restricted to the influence of hydrogen on the mechanical  
properties of titanium and its alloys in the form of smooth  
specimens with medium rates of deformation at room temperature.  
Technically pure titanium and its alloys VT-3, VT-3-1, VT-6,  
VT-5-1 were investigated. The first three alloys are  $\alpha + \beta$   
alloys, the last is an  $\alpha$ -titanium alloy.- The investigations  
showed that all four alloys absorb the hydrogen more intensely  
than the technically pure titanium. This seems to be caused by  
the smaller diffusion rate of hydrogen in titanium in the

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Influence of Hydrogen on the Mechanical Properties  
of Titanium and Its Alloys

SOV/163-58-4-44/47

presence of alloying components. The strength characteristics of the technically pure titanium depend, in a wide range of concentration, very little on the hydrogen content, while the stretching and transverse contraction decrease with an increase in hydrogen content. But in the ranges corresponding to real conditions of production, the limit of strength, the flow limit, the stretching, and the transverse contraction are virtually independent of the hydrogen content. The notch impact strength changes little up to 0.015% H<sub>2</sub>, but then falls suddenly down to very low values.- The behavior of the two alloy groups was different. A microstructure analysis was carried out to explain the strong differences. The causes are shown here for such different behavior. There are 5 figures, 2 tables, and 10 references, 2 of which are Soviet.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskii institut  
(Moscow Air Technological Institute)

SUBMITTED: October 5, 1957

Card 2/2

PETROV, D.A., doktor tekhn.nauk, prof.; BUKHANOVA, A.A., kand.tekhn.nauk

Change of form and redistribution of crystals during dissolution  
and growth in the solid state. Trudy MATI no.31:161-171 '58.

(MIRA 11:7)

(Metal crystals) (Solutions, Solid) (Alloys--Heat treatment)

S/536/60/000/043/008/011  
E021/E435

AUTHORS: Livanov, V.A., Professor, Bukhanova, A.A., Candidate  
of Technical Sciences and Kolachev, B.A., Candidate of  
Technical Sciences

TITLE: The Interaction of Titanium With Moist Atmosphere and  
Air

PERIODICAL: Moscow. Aviatsionnyy tekhnologicheskii institut.  
Trudy. No.43. 1960. PP.91-99. Termicheskaya obrabotka  
i svoystva stali i legkikh splavov

TEXT: The kinetics of the interaction between titanium sponge of  
2 types with moist atmosphere and the kinetics of extraction of  
volatile impurities in the process of vacuum roasting at various  
temperatures were studied. The chemical composition of the  
sponge (in %) was:  $Ti_2$  (TG2): 0.3 Fe, 0.15 Si, 0.05 C, 0.07 Mg, —  
0.2  $O_2$ , 0.03  $H_2$ , 0.05  $N_2$ , 0.07 Cl, remainder Ti;  
 $Ti_3$  (TG3): 0.4 Fe, 0.2 Si, 0.07 C, 0.12 Mg, 0.519  $O_2$ , 0.026  $H_2$ ,  
0.397 N, 0.14 Cl, remainder Ti. A titanium electrode prepared  
from TG2 was also investigated. 12 to 13 g of the titanium was  
placed in a desiccator which had a beaker of water in the bottom.  
A moist atmosphere was obtained and the reaction was studied by  
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following the change in weight of the titanium using an analytical balance. A vacuum apparatus was used to study the kinetics of extraction from the sponge of absorbed moisture and other volatile impurities. The change in weight with time (in days) of the electrode and TG2 sponge is shown in Fig.2. The weight of the electrode (curve 1) increases more than that of the sponge (curve 4) from which it was prepared. The initial sponge absorbs less water vapour than the sponge preliminarily dried at 300°C (curve 3). The electrode preliminarily washed in hot water (curve 2) is less hygroscopic than the initial electrode. Fig.3 shows the increase in weight of sponge TG3 in a moist atmosphere (curves 1 and 2) and air (curve 3). Curve 1 is for the sponge in its initial condition and curve 2 after saturation with hydrogen and a vacuum treatment at 900°C. TG3 is more hygroscopic than TG2 but the hydrogen and vacuum treatment decrease its tendency to absorb moisture. The result is explained by the fact that there is more  $MgCl_2$  on the surface of TG3 than on TG2. This is shown by the chemical analysis after boiling the sponge and the electrode (Table 2). When the electrode is pressed, more  $MgCl_2$  is

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uncovered on the surface. After removing the  $MgCl_2$  from the surface, the ability of the sponge and electrode to absorb moisture decreases. Fig.4 shows the change in weight (decrease) with time (in hours) of TG2 and TG3 with gradually increasing temperature as the process of vacuum extraction proceeds. Fig.5 shows the quantity of moisture extracted from TG2 against time (in hours) during vacuum extraction. The quantity extracted is 0.0044% after 10 hours at 20°C. Raising the temperature to 115°C increases this to 0.0062%. Further increases in temperature have little effect. Fig.6 shows the change in weight against time (in hours) during vacuum extraction of the electrode at various temperatures. Increasing the temperature from 20 to 100 °C gives an increase in the amount extracted. Further increases in temperature lead to a decrease, indicating that at these temperatures interaction between the water vapour and the electrode occurs. Fig.7 shows the change in weight against time (in minutes) of TG3 during vacuum extraction. Increasing the temperature from 20 to 400°C increases the amount extracted. Fig.8 shows the change in weight of TG2 sponge and the electrode (bottom curve) during alternate saturation with water vapour and vacuum extraction at 100°C.

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S/536/60/000/043/009/011  
E021/E435

**AUTHORS:** Livanov, V.A., Professor, Bukhanova, A.A., Candidate of Technical Sciences and Kolachev, B.A., Candidate of Technical Sciences

**TITLE:** The Influence of Hydrogen on the Mechanical Properties of Titanium and its Alloys With Various Straining Conditions

**PERIODICAL:** Moscow. Aviatsionnyy tekhnologicheskii institut. Trudy. No.43. 1960. pp.100-105. Termicheskaya obrabotka i svoystva stali i legkikh splavov

**TEXT:** The mechanical properties of titanium and its alloys were tested on smooth samples at room temperature with three rates of strain: 0.1 to 0.2 mm/min, 3 to 5 mm/min and 30 to 50 mm/min. Specimens tested were commercial titanium,  $\alpha$  alloy BT 5-1 (VT5-1) and two  $\alpha + \beta$  alloys BT 3-1 (VT3-1) and BT 6 (VT6). Chemical analysis is given in Table 1. Samples were forged at 1000°C from billets made in a furnace with a consumable electrode. They were cooled in air and specimens were cut from them for testing. The specimens were treated in vacuo at 900°C for 6 hours and cooled in Card 1/8

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the furnace, in order to remove the hydrogen. The mechanical properties are given in Table 2. The specimens were then saturated with hydrogen, the hydrogen content being determined from the change in weight and from the change in pressure of hydrogen in the system. The hydrogen in the samples after vacuum treatment was determined by the fusion method. Fig.1 to 4 show the influence of hydrogen on the mechanical properties of the alloys (Fig.1 - commercial Ti; Fig.2 - VT5-1; Fig.3 - VT3-1; Fig.4 VT6). The properties increase markedly with increase in strain rate. The plastic properties decrease considerably with increase in hydrogen content, especially the reduction in area. Alloy VT6 is not subject to hydrogen embrittlement even up to 0.05% H<sub>2</sub>. This may be because there is no eutectoid decomposition of the  $\beta$  phase with decrease in temperature. There are 4 figures, 2 tables and 4 non-Soviet-bloc references. The references to English language publications read as follows: H.M.Burte, Metal Progress, 1955, No.5, p.115-120; E.J.Ripling, J.Metals, 1956, 8(II), No.8, p.907-913; R.I.Jaffee, D.A.Lenning, C.M.Graighead, J.Metals, 1956, 8(II), No.8, p.923-928.

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18.1285

1416 1418 1454

30924  
S/536/61/000/050/006/017  
D217/D304

AUTHORS: Livanov, V.A., Professor, Bukhanova, A.A., and Kolochev, B.A., Candidates of Technical Sciences

TITLE: Influence of hydrogen on the structure and properties of the alloys VT 8 (VT8) and VT10 (VT10)

SOURCE: Moscow. Aviatsionnyy tekhnologicheskii institut. Trudy, no. 50, 1961, Voprosy metallovedeniya, 52-60

TEXT: The influence of hydrogen on the mechanical properties of the  $\alpha + \beta$  titanium alloy VT8 and of the  $\alpha$ -titanium alloy VT10 was studied at various rates of deformation. The specimens were cut from hot forged rods of 14 x 14 mm cross section. Sections from these were annealed in vacuo at 900°C for 6 hours and then saturated with hydrogen. The specimens were then furnace cooled. The hydrogen content was determined from the gain in weight of the specimens, as well as from the change in hydrogen pressure in the system. The hydrogen remaining in the specimens

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after vacuum annealing was determined by the melting method and included in the results obtained. The hydrogen-saturated specimens were tested for tensile strength and impact resistance. Tensile tests were carried out on smooth specimens at room temperature at three different deformation rates: (a) 0.1-0.2 mm/minute; (b) 3-5 mm/minute and (c) 30-50 mm/min. (3-5 mm/min. is the deformation rate normally used for commercial tensile testing). It was found that hydrogen, even if present in extremely small quantities (above 0.01%), seriously reduces the plastic properties of the  $\alpha$ -titanium alloy VT10, especially as regards high rates of deformation. The plastic properties of the  $\alpha + \beta$  alloy VT8 in the presence of hydrogen decrease to a lesser extent than those of the former alloy, and even 0.05% hydrogen does not give rise to a serious reduction in plasticity. However, the ductile characteristics of this alloy at low deformation rates fall sharply when the hydrogen content exceeds 0.02 wt.%. There are 6 figures, 1 table and 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: H.M. Burte, Metal Progress, 1955, v. 66, no. 5, pp. 195-120; R.I. Jaffe, G.A. Lenning, C.M. Graighead, J. of Metals, 1956, no. 8, pp. 923-928.

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18.1285

30925  
S/536/61/000/050/007/017  
D217/D304

AUTHORS: Livanov, V.A., Professor, ~~Bukhanova, A.A.~~ and Kolachev, B.A., Candidates of Technical Sciences

TITLE: Influence of grain size on the hydrogen embrittlement of titanium and its alloys

SOURCE: Moscow. Aviatsionnyy tekhnologicheskii institut. Trudy, no. 50, 1961, Voprosy metallovedeniya, 61-70

TEXT: The main purpose of this paper was to investigate the influence of hydrogen on the mechanical properties of fine grained and coarse grained titanium and its alloys. Specimens of commercially pure titanium were made from forged rods and annealed in vacuo at 700°C, 900°C and 1100°C. Annealing at 700°C results in a fine-grained structure; at 900°C, medium-sized grains form, whilst at 1100°C the structure becomes coarse-grained. After vacuum annealing, the specimens were furnace-cooled. Various quantities of hydrogen were then introduced into them at the same temperatures at which vacuum annealing had been carried out. X

Card 1/2

Influence of grain ...

30925  
S/536/61/000/050/007/017  
D217/D304

Soaking time before and after saturation with hydrogen at the above temperatures was one hour in each case. The subsequent cooling was carried out in the furnace. The dependence of the mechanical properties of Ti on hydrogen content was studied after vacuum annealing at 1100°C and saturation with hydrogen at 1100°C and 900°C, and the microstructure of Ti saturated with hydrogen at various temperatures was compared with that of commercially pure Ti after vacuum annealing at the same temperatures. It was found that the coarse-grained metal had a greater tendency to hydrogen embrittlement than fine-grained material; this is due to differences in the nature of the hydride precipitates. In the fine-grained material, Ti hydrides separate along the grain boundaries in the form of compact, often formless, precipitates. In the coarse-grained material, Ti hydrides precipitate in the form of very fine platelets. This fine precipitate causes high stress concentrations and premature destruction of the metal. There are 8 figures. X

Card 2/2

LIVANOV, V.A., prof.; BUKHANOVA, A.A., kand.tekhn.nauk; KOLACHEV, B.A.,  
kand.tekhn.nauk

Effect of hydrogen on the thermal stability of the BT3-1 alloy.  
Trudy MATI no.50:71-81 '61. (MIRA 14:10)  
(Titanium alloys--Hydrogen content)  
(Phase rule and equilibrium)



LIVANOV, V.A., prof.; BUKHANOVA, A.A., kand.tekhn.nauk; KOLACHEV, B.A.,  
kand.tekhn.nauk

Effect of oxygen and hydrogen on the structure and properties  
of titanium. Trudy MATI no.50:82-92 '61. (MIRA 14:10)  
(Titanium--Oxygen content) (Titanium--Hydrogen content)

LIVANOV, V.A., prof.; BUKHANOVA, A.A., kand.tekhn.nauk; KOLACHEV, B.A.,  
kand.tekhn.nauk

Hydrogen embrittlement of titanium-aluminum alloys. Trudy MATI  
no. 50:93-102 '61. (MIRA 14:10)  
(Titanium-aluminum alloys--Hydrogen content)

25863

S/020/61/139/004/023/025  
B127/B212

18.9500

AUTHORS: Petrov, D. A., and Bukhanova, A. A.  
TITLE: Undercooling of melts, and crystal growth by  
Chokhral'skiy's method  
PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 4, 1961, 933-935

TEXT: Undercooling plays an important part in crystal growing by Chokhral'skiy's method, and also in the distribution of impurities in crystals. This applies chiefly to germanium and silicon but also to aluminum, copper, iron, and all other relatively pure crystallizing substances. In an asymmetric temperature field, non-rotating crystal is inclined to the cold part of the field. Two neighboring regions with different etch patterns, obtained by etching with an aqueous NaOH solution, appear on the longitudinal face of an aluminum crystal with  $10^{-4}$  %  $\text{Cu}^{64}$  content, which was grown at a rate of 2 mm/min without rotation. The regions extend in the direction of growth. On the cold side, the crystal will absorb more impurities than on the hot one. If the crystal is rotated during growing through  $180^\circ$ , undercooling of the melt decreases on the hot  
Card 1/2

25863

S/020/61/139/004/023/025

Undercooling of melts, and crystal growth ... B127/B212

side and increases on the cold side. A longitudinal section of such a crystal which is periodically rotated through by  $180^\circ$ , shows a pattern of mutually oriented wedges. Continuous rotation of the crystal during growth will result in a screw-type pattern. The pitch of the screw is determined by the growth rate  $v_1$  of the crystal, the velocity  $v_2$  at which the level of the melt is dropping in the crucible, and the number of rotations  $n$  of the crystal per unit time:  $S = f\left(\frac{v_1 + v_2}{n}\right)$ . If such a crystal is etched, the etchings will follow the screw line. It will become wider, and the structure will change when the rotation speed is reduced. There are 4 figures.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskii institut  
(Moscow Aviation Technological Institute)

PRESENTED: January 20, 1961, by A. A. Bochvar, Academician

SUBMITTED: January 16, 1961

Card 2/2

BUKHANOVA, AA

PHASE I BOOK EXPLOITATION

SOV/6171

• Livanov, Vladimir Aleksandrovich, Anna Arkhipovna Bukhanova, and Boris Aleksandrovich Kolachev

• Vodorod v titane (Hydrogen in Titanium). Moscow, Metallurgizdat, 1962. 244 p. Errata slip inserted. 2900 copies printed.

Ed.: L. P. Luzhnikov; Ed. of Publishing House: M. S. Arkhangel'skaya; Tech. Ed.: L. V. Dobuzhinskaya.

PURPOSE: This book is intended for scientific workers, engineers, and technicians at plants and scientific research institutes engaged in the production, treatment, and application of titanium and its alloys. It may also be useful to aspirants and senior students at schools of higher technical education, who specialize in physical metallurgy, technology of heat treatment, casting, forming, and welding of metals. It may likewise be of interest to design engineers.

Card 1/13 2

Hydrogen in Titanium

SOV/6171

COVERAGE: The book deals with the interaction of titanium with hydrogen and water vapor. Equipment used for investigating this interaction is described. Behavior of hydrogen in the arc melting and vacuum degassing of titanium is also discussed. Particular attention is given to the effect of hydrogen on the structure and mechanical properties of titanium and its alloys, thermal stability of alloys, and their susceptibility to crack formation. The mechanism of hydrogen embrittlement of titanium and its alloys and methods of preventing it are dealt with at length. The authors thank M. A. Vershkov, P. A. Nuss, L. A. Shelkova, N. V. Il'ichev, I. V. Kashkin, Ye. I. Dukhanova, N. Ya. Gusel'nikov, L. P. Luzhnikov, and V. I. Mikheyev for their assistance. There are 145 references, Soviet and non-Soviet.

TABLE OF CONTENTS:

Foreword

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Card 2/13 2

S/070/62/007/003/016/026  
E132/E460

AUTHORS: Petrov, D.A., Bukhanova, A.A.

TITLE: The determining role of the supercooling of the melt in the formation of screw macro-nonuniformities in crystals grown by Czochralski's method

PERIODICAL: Kristallografiya, v.7, no.3, 1962, 442-445 + 1 plate

TEXT: It has been experimentally shown that if a crystal is not rotated a certain nonuniformity occurs which is connected with the asymmetry of the thermal field and manifests itself in the formation of two bands differing in structure and in impurity content which lie along the whole length of the crystal. A strongly etched region with a high impurity content is formed on the cold side of the field and a weakly etched region with a low impurity content on the warmer side. Rotation of the crystal aggravates the nonuniformity in the melt, due to the asymmetry of the field and leads to screw macro-nonuniformities in the crystal. The latter are exhibited in the forms of two mixed layers, creeping into the volume of the crystal in the form of a screw, which are different in structure, impurity contents and properties. Removal of this defect is possible by means of the creation of a  
Card 1/2

The determining role of ...

S/070/62/007/003/016/026  
E132/E460

symmetrical heat field. There are 6 figures.

ASSOCIATIONS: Moskovskiy energeticheskiy institut (Moscow  
Power Engineering Institute)  
Moskovskiy aviatsionnyy tekhnologicheskiy institut  
(Moscow Aviation Technology Institute)

SUBMITTED: March 29, 1961

Card 2/2



ACCESSION NR: AT 4007054

S/2598/63/000/010/0307/0316

AUTHOR: Livanov, V. A.; Bukhanova, A. A.; Kolachev, B. A.; Gusel'nikov, N. Ya.

TITLE: Hydrogen embrittlement of titanium alloys

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy\*, no. 10, 1963. Issledovaniya titanovy\*kh splavov, 307-316

TOPIC TAGS: titanium alloy, VT-3-1 titanium alloy, titanium alloy embrittlement, titanium alloy hydrogen embrittlement, hydrogen embrittlement, VT-3-1 alloy embrittlement, VT-4 titanium alloy, VT-5 titanium alloy, VT-10 titanium alloy

ABSTRACT: It has been stated that hydrogen exerts a detrimental effect on the mechanical properties of titanium and its alloys. Introduction of small quantities of hydrogen into titanium and its alpha alloys drastically reduces their impact strength. Unlike alpha alloys, the alpha-beta alloys do not exhibit hydrogen embrittlement during impact ductility tests, but only in tests at small strain velocities. Hydrogen embrittlement of the alpha-beta alloy VT-3-1 and of the alpha alloys VT-4, VT-5, and VT-10 was studied by the authors at various hydrogen concentrations (0.002 — 0.05 %) and strain velocities (0.1 — 4 mm/min), and after different heat and natural aging treatments. The mechanical

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ACCESSION NR: AT 4007054

properties measured in the tests conducted by the authors are the ultimate tensile strength, yield strength, specific elongation, and contraction of cross-sectional area of the test specimen. It was concluded that: (1) Alpha-beta alloys exhibit hydrogen embrittlement at low strain velocities and this embrittlement is assisted by low temperature and by the presence of notches. (2) A certain minimum hydrogen content is required for the development of alpha-beta alloy embrittlement. After standard heat treatment alloy VT-3-1 exhibits hydrogen embrittlement at a hydrogen content exceeding 0.03%; after quenching, however, alloy VT-3-1 shows hydrogen embrittlement at 0.01%. This embrittlement is accompanied by a reduction of plasticity and an increase of tensile strength. The decrease of plasticity appears, not immediately after quenching, but in the process of natural aging after quenching. (3) Titanium-base alpha alloys VT-4, VT-5, and VT-10 like the alpha-beta alloys, exhibit hydrogen embrittlement at low strain velocities. This can be explained by a regrouping of hydrogen under the influence of stresses. Consequently, it is necessary to revise the existing mechanism explaining the brittle fracture of alpha-beta alloys caused by hydrogen. It has been suggested that hydrogen embrittlement of alpha-beta alloys is caused by processes developing in both alpha and beta phases: hydrogen diffuses toward microdefects or grain boundaries where a formation of microvolumes enriched with hydrogen takes place; at hydrogen concentra-

Card 2/3

ACCESSION NR: AT 4007054

tions above a certain limit microfissures begin to develop in the microvolumes and lead to the failure of a manufactured item. Orig. art. has: 7 figures and 1 table.

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute AN SSSR)

SUBMITTED: 00

DATE ACQ: 27Dec63

ENCL: 00

SUB CODE: MM

NO REF SOV: 005

OTHER: 004

Card 3/3

L 14318-65 EWT(m)/EWP(b)/EWA(d)/EWP(w)/EWP(t) IJP(c)/ASD(m)-3 JD/MLK  
 ACCESSION NR: AT4048056 S/0000/64/000/000/0088/0094

AUTHOR: Kolachev, B.A., Livanov, V.A., Bukhanova, A.A.

TITLE: Dislocation theory of the hydrogen brittleness of titanium alloys

SOURCE: Soveshchaniye po metallurgii, metallovedeniyu i primeneniyu titana i yego  
splavov. 5th, Moscow, 1963. Metallovedeniye titana (Metallography of titanium);  
trudy\* soveshchaniya. Moscow, Izd-vo Nauka, 1964, 88-94

TOPIC TAGS: dislocation theory, hydrogen brittleness, titanium alloy, titanium alloy  
 brittleness, hydrogen atom mobility, brittleness temperature

ABSTRACT: The study concerns the reversible brittleness developing in typical  $\alpha + \beta$   
 alloys at low deformation rates. It is assumed that at a temperature below some  
 critical  $T_0$  the hydrogen will form Kottrell atmospheres at the dislocations; if the de-  
 formation rate is low and temperatures so high that the mobility of the hydrogen atoms  
 approximates the deformation rate, the dislocations will transport the atmospheres to  
 the boundary of the grain; this will result in segregation of the hydrogen, facilitating de-  
 generation and enlargement of the grooves. The mathematical basis is given by the  
 Kottrell formula  $v_c = \frac{4D}{l}$  where  $v_c$  is the critical velocity at which the atmospheres

Card 1/3

L 14318-65

ACCESSION NR: AT4048056

begin to be carried away by the mobile dislocations,  $D$  the diffusion coefficient of the admixture, and  $l$  the characteristic length. This formula is further developed. The critical deformation rate increases with temperature but does not depend on the hydrogen content of the alloy, while the temperature  $T_0$  at which plasticity is restored and the related  $T'_0$  depend on the mean hydrogen concentration. The temperature interval within which hydrogen brittleness can develop is bounded above by the dissociation temperature of the Cottrell atmospheres ( $T_0$ ) and below by  $T_H$ , below which the dislocations leave the Cottrell atmospheres. The point of intersection of the curves characterizing these temperatures determines the maximal admissible hydrogen concentration for which no hydrogen brittleness will appear at a given deformation rate. This theory affords explanation of the regularities observed for the above alloys: their tendency towards hydrogen brittleness with increased hydrogen content, decreased temperature and decreased deformation rate; the intercrystalline character of the break; higher temperatures for transit from viscous to brittle break with increased hydrogen content. The regularities to be expected from the dislocation theory agree satisfactorily with experimental data for the alloy Ti140A (0.0375% by weight  $H_2$ ). Orig. art. has: 5 figures and 4 formulas.

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L 14318-65

ACCESSION NR: AT4048056

SUBMITTED: 15Jul64

ENCL: 00

SUB CODE: MM

NO REF SOV: 003

OTHER: 002

Card 3/3

L 26109-65 EWT(1)/EWT(m)/EWP(w)/EWA(d)/EPR/T/EWP(t)/EWP(b) Ps-4 IJP(c)

ACCESSION NR: AP4047492 MJW/JD

S/0149/64/000/004/0124/0129

AUTHOR: Livanov, V. A.; Bukhanova, A. A.; Kolachev, B. A.; Neverova-Skobeleva, N. P.; Slavina, I. I.; Sheynin, B. Ye.; Shcherbina, L. V.

40  
39  
B

TITLE: Effect of hydrogen on the mechanical properties of titanium and OT4-1 alloy

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 4, 1964, 124-129

TOPIC TAGS: titanium, titanium alloy, titanium mechanical property, titanium alloy strength, hydrogen content, brittle failure/alloy OT4-1

ABSTRACT: The aim of this work was to study the influence of hydrogen on the mechanical properties of OT4-1 alloy, particularly on the impact strength, and to establish the maximum permissible hydrogen content at which the high resistance of the metal to brittle failure is still retained. For comparison, identical tests were carried out on technical-grade titanium, brand VT1-1. It was found that of all the properties studied, the impact strength of VT1-1 and OT4-1 was the most sensitive to changes in hydrogen content. The lower this content, the lesser the tendency of the titanium alloys toward brittle failure. The authors were unable to establish the maximum permissible hydrogen

Cord 1/2

L 26109-65

ACCESSION NR: AP4047492

content and indicate the need for further investigations in this direction. Heating of OT-4 to 900C followed by cooling in air or in water reduces the adverse effect of hydrogen on the impact strength (at the hydrogen contents studied, i.e., up to 0.01%). However, additional experiments are needed for a better understanding of the stability of the properties obtained during the heat treatment and in the course of natural and artificial aging. Orig. art. has: 5 figures and 5 tables.

ASSOCIATION: Kafedra metallovedeniya i tekhnologii termicheskoy obrabotki, Moskovskiy aviatsionnyy tekhnologicheskiy institut (Metal science and heat treatment department, Moscow aviation technology institute)

SUBMITTED: 30Aug63

ENCL: 00

SUB CODE: MM

NO REF SOV: 002

OTHER: 001

Card 2/2



ACCESSION NR: AP4043382

S/0181/64/006/008/2518/2519

AUTHORS: Bukhanova, A. A.; Petrov, D. A.

TITLE: Growth of germanium dendrites in so-called "difficult" directions

SOURCE: Fizika tverdogo tela, v. 6, no. 8, 1964, 2518-2519

TOPIC TAGS: germanium, fiber crystal, twinning

ABSTRACT: It was stated earlier by E. Billig (Proc. Roy. Soc. ser. A, 229, 343, 1955) and by A. J. Bennett and R. J. Longini (Phys. Rev. v. 116, 53, 1959) that germanium dendrites with two  $(111)$  principal surfaces cannot be produced ("difficult" directions). The present authors are apparently the first to establish that the principal role in the growth of different types of dendrites of germanium is played by the distances between the twinning planes in the dendrite. Growth of dendrites becomes possible when the distance be-

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ACCESSION NR: AP4043382

tween the twinning planes reaches 8--10 microns and more, and in the case of dendrites with three twinning planes, an important role is played by the ratio between the two distances, the optimum being 1:1. Under these conditions, "easy" directions become "difficult" and vice versa, so that the concept of easy and difficult directions introduced by Bennett and Longini becomes meaningless. Photographs of dendrites grown with two (111) and two ( $\bar{1}\bar{1}\bar{1}$ ) surfaces are presented. It is also shown that when the dendrite breaks away from the melt, side stubs are formed in all four directions (both easy and difficult). This equivalence of the four lateral directions is in contradiction with the results of N. Albon and A. E. Owen (J. Phys. Chem. Sol., v. 24, 899, 1962). Orig. art. has: 3 figures.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskii institut (Moscow Aviation Technological Institute)

SUBMITTED: 22Feb64

SUB CODE: SS

NR REF SOV: 000

ENCL: 00

OTHER: 002

Card 2/2

ACCESSION NR: AP4043383

S/0181/64/006/008/2520/2521

AUTHORS: Bukhanova, A. A.; Petrov, D. A.

TITLE: Growth of  $\langle 110 \rangle$  dendrites of germanium

SOURCE: Fizika tverdogo tela, v. 6, no. 8, 1964, 2520-2521

TOPIC TAGS: germanium, fiber crystal, twinning

ABSTRACT: Germanium dendrites grown with two twinning planes exhibit a stable growth for all thicknesses of the twinning plate, from fractions of a micron up to at least 300 microns. However, in the case of thin twinning plates, below 6--7 microns, the lateral branches of the dendrites include those growing in the  $\langle 110 \rangle$  directions. Between 6--7 and 2 microns mixed growth is observed in the  $\langle 112 \rangle$  and  $\langle 110 \rangle$  directions. Below 2 microns, only  $\langle 110 \rangle$  dendrites grow. The  $\langle 110 \rangle$  dendrites differ from  $\langle 112 \rangle$  in much greater homogeneity both on the surface layers and in the deeper layers. Photo-

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ACCESSION NR: AP4043383

graphs presented by the authors show that the individual links of the  $\langle 110 \rangle$  dendrite, in hexagonal form, grow into each other parallel to one of the pairs of the sides when joined together, unlike the  $\langle 112 \rangle$  dendrites, which join together in a direction perpendicular to one of the pairs of the sides of the link. Orig. art. has: 2 figures.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskii institut  
(Moscow Aviation Technological Institute)

SUBMITTED: 22Feb64

ENCL: 00

SUB CODE: SS

NR REF SOV: 000

OTHER: 001

Card 2/2

L 17157-65 EWT(1)/EWT(m)/EWP(t)/EWP(b) Pa-4 IJP(c)/AS(mp)-2/ASD(a)-5/  
AFWL/SSD/RAEM(c)/ESD(gs)/ESD(t) JD  
ACCESSION NR: AP4048408 S/0181/64/006/011/3331/3335

AUTHOR: Petrov, D. A.; Bukhanova, A. A.

TITLE: On the concept of reentrant angle as applied to the growth  
of dendrites with diamond structure

SOURCE: Fizika tverdogo tela, v. 6, no. 11, 1964, 3331-3335

TOPIC TAGS: crystal growth, filament crystal, crystal lattice  
structure, dendrite, diamond, germanium, reentrant angle

ABSTRACT: The authors discuss photographs of two crystals grown  
from seeds in the [121] and [121] directions, and having  
one twin plane. An analysis of these photographs shows that the  
planes propagating during the growth of these crystals form angles  
which emerge from the crystal, thus refuting the mechanism proposed  
by R. S. Wagner for the growth of germanium dendrites (Acta Metal-  
lurgica, v. 8, 57, 1960), whereby the angle  $\alpha$  is supposed to enter into

Cord 1/3

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ACCESSION NR: AP4048408

the crystal. The real growth of a  $[1\bar{2}1]$  crystal is shown in Fig. 1 of the Enclosure, where the angle emerging from the crystal forms a dihedral angle of  $140^\circ 04'$ . The sides of the reentrant angle form the propagating planes of the growing crystal. Orig. art. has: 7 figures.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskii institut (Moscow Aviation Technological Institute)

SUBMITTED: 22Feb64

ENCL: 01

SUB CODE: SS

NO REF SOV: 000

OTHER: 003

ATD PRESS: 3150

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L 17157-65  
ACCESSION NR: AP4048408

ENCL: 01

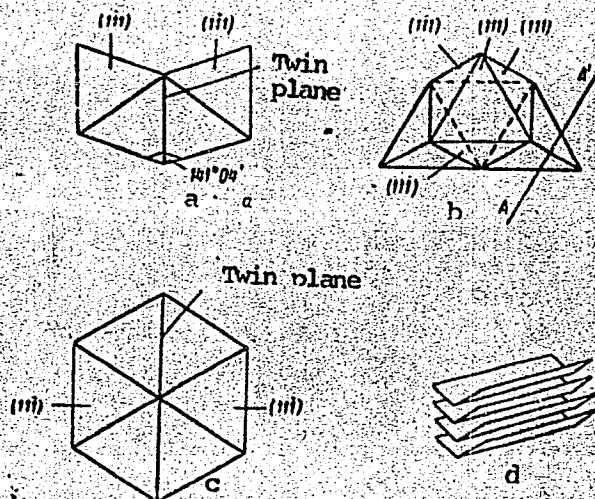


Fig. 1. Analysis of the growth of germanium crystal  $[1\bar{2}1]$

a - Orientation of the crystal along the growth direction perpendicular to the twin plane; b - same, parallel to twin plane; c - orientation of hexagonal crystal on the melt side; d - scheme showing real crystal growth

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L 61833-65 EWT(m)/EMP(w)/EPT(c)/EWA(d)/T/EMP(t)/EMP(k)/EMP(z)/EMP(t)/EWA(c)

PT-1/PT-1 IJP(c) MJW/JD/HW/EM

ACCESSION NR: AP5016350

UR/0149/65/000/002, 0131/0135  
669.295

AUTHOR: Kolachev, B. A.; Livanov, V. A.; Bukhanova, A. A.; Gusel'nikov, N. Ya.

TITLE: Effect of cooling rate on the tendency of  $\alpha$  titanium alloys toward hydrogen brittleness

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 2, 1965, 131-135, and insert facing p. 134

TOPIC TAGS: titanium alloy, hydrogen brittleness, tensile stress, metal deformation

ABSTRACT: In order to study the hydrogen brittleness of  $\alpha$  alloys, the effect of hydrogen on the structure and properties of VT5 and VT5-1 alloys (after furnace cooling in air and quenching in water) was investigated. Contrary to the prevailing view, it was shown that these alloys, like ( $\alpha + \beta$ )-alloys, tend to display hydrogen brittleness under certain conditions, when the cross-bars of the tensile impact testing machine move at slow rates. This brittleness develops to the greatest extent in quenched  $\alpha$  titanium alloys. The approach used in determining the hydrogen brittleness in these alloys is therefore the same as that used for ( $\alpha + \beta$ )-alloys.

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L 61833-65

ACCESSION NR: AP5016350

3

In the case of annealed  $\alpha$  alloys, the mechanical properties should be determined by tests involving high deformation rates, in particular, impact tests; in the case of quenched  $\alpha$  alloys, the cross-bars of the machine should be displaced at slow rates. The hydrogen brittleness of quenched  $\alpha$  titanium alloys which develops at slow deformation rates is due to the decomposition of supersaturated solutions of hydrogen in the  $\alpha$  phase under the influence of the applied stresses. The hydrides separating from the supersaturated solutions under the influence of these stresses are preferentially arranged perpendicular to the direction of the tensile stresses, causing brittle failure. Orig. art. has: 4 figures.

ASSOCIATION: Kafedra metallovedeniya i termicheskoy obrabotki, Moskovskiy aviatsionnyy tekhnologicheskoy institut (Department of Physical Metallurgy and Heat Treatment, Moscow Aviation Technological Institute)

SUBMITTED: 03Jan64

ENCL: 00

SUB CODE: MM, TD

NO REF SOV: 003

OTHER: 000

dm  
Card 2/2

L 58361-65 EWT(m)/EWA(d)/I/EWP(t)/EWP(z)/EWP(b)/EWA(c) IJP(c) MJW/JD  
ACCESSION NR: AP5013151 UR/0129/61/000/005/0009/0015

AUTHOR: Kolachev, B. A.; Livanov, V. A.; Bukhanova, A. A.; Gusel'nikov, N. Ya.

TITLE: The effect of hydrogen on the mechanical properties of quenched Ti alloys

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 5, 1965, 9-15

TOPIC TAGS: titanium alloy, metal mechanical property

ABSTRACT: The structure and properties of VT3-1, VT8, and VT6 alloys were studied with respect to the effects of hydrogen. After processing, rods of 60-70 mm diameter were heat treated in various ways to retain or to remove hydrogen. The removal was done by heating in a vacuum furnace at 900°C for 6 hrs, and furnace cooling. The properties were then compared to samples annealed by standard procedures. Vacuum annealed samples had higher ductilities and retained approximately the same strength levels. The effects of hydrogen were related to the mechanical properties of the Ti alloys, both after quenching, and after quenching and room temperature aging. In general, strength increased and ductility diminished with increased hydrogen content (0.001 to 0.04% H). The aging treatment offset the curves of strength and ductility, with ductility gradually diminishing with increased aging

Card 1/2

L 58361-65

ACCESSION NR: AP5013151

times. Tests were run on VT8 alloy at high and low speeds of deformation. The mechanical properties did not change significantly, even at high contents of hydrogen. Microstructural analysis of all the alloys in the quenched condition shows the effect of increasing hydrogen contents. In general, increasing the H level resulted in an increased amount of martensitic phase in the  $\beta$ -matrix. No changes were noticed in the structures after prolonged room temperature aging. Orig. art. has: 2 figures, 4 tables.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: MM

NO REF SOV: 000

OTHER: 000

Card *AR*  
2/2

KOLAGHEV, B.A.; LEVONOV, V.A.; BUKHANOVA, A.A.; GUSEL'NIKOV, N.Ya.

Effect of hydrogen on the mechanical properties of hardened  
titanium alloys. Metalloved. i term. obr. mat. no. 5:9-15 My  
1965.  
(MIRA 18:7)

L 5031-66 EWT(1)/EWT(m)/EWA(d)/EWP(t)/EWP(z)/EWP(b) IJP(c) MJW/JD  
 ACC NR: AP5022342 SOURCE CODE: UR/0149/65/000/003/0131/0135 77  
 AUTHOR: Kolachev, B. A.; Livanov, V. A.; Bukhanova, A. A.; 44.55 47.55  
 Gusel'nikov, N. Ya. 44.55  
 ORG: Moscow Aviation Technological Institute (Moskovskiy aviatsionnyy  
 tekhnologicheskii Institut) 44.55  
 TITLE: Effect of hydrogen on the structure and properties of VT15 alloy  
 SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 3, 1965, 131-135.  
 TOPIC TAGS: alloy, titanium alloy, aluminum containing alloy,  
 molybdenum containing alloy, chromium containing alloy, hydrogen  
 containing alloy, alloy structure, alloy property/VT15 alloy  
 ABSTRACT: The effect of hydrogen on the structure and properties of  
 VT15 8-aluminum alloy (3.7% Al, 7.35% Mo, 10.6% Cr, 0.11% Fe, 0.04% Si,  
 0.03% C, and 0.12% O<sub>2</sub>) has been investigated. Forged bars 14 x 14 x 70 mm  
 of twice vacuum-arc melted alloy were vacuum annealed at 900C for 6 hr,  
 impregnated with hydrogen, annealed at 780C for 1 hr, and water  
 quenched. Some bars after quenching were aged at 480C for up to 24 hr.  
 It was found that the tensile and yield strengths of as-quenched  
 alloy increased somewhat as the hydrogen content increased from 0.1 to  
 0.2%; the elongation and reduction of area dropped, however, the  
 latter from 65.8% at 0.002% hydrogen to 53.4% at 0.2% hydrogen. At a  
 Card 1/2 UDC: 669.295

L 5031-66

ACC NR: AP5022342

deformation rate of 4 mm/min, the tensile and yield strengths were higher than those obtained at a deformation rate of 0.4 mm/min at all hydrogen contents. The tensile strength of aged alloy is not affected by hydrogen at contents up to 0.05%, but drops with a further increase in hydrogen: at hydrogen contents of 0.002, 0.05, and 0.1% the tensile strength was 168, 169, and 152 kg/mm<sup>2</sup>. Elongation and reduction of area increase from 3 and 10% at 0.002% hydrogen to 7 and 13% at 0.1% hydrogen. The structure of as-quenched alloy consisted of only the  $\beta$ -phase at all hydrogen contents. In aged alloy, the amount of precipitated  $\alpha$ -phase decreases with increasing hydrogen content. Thus, hydrogen at contents up to 0.2% does not cause an embrittlement of heat-treated VT15 alloy at room temperature. It increases the stability of  $\beta$ -phase and reduces the rate of  $\beta$ -phase decomposition and the rate of  $\alpha$ -phase formation. Orig. art. has: 4 figures. [AZ]

SUB CODE: MM/ SUBM DATE: 03Jan64/ ORIG REF: 004/ OTH REF: 001/  
ATD PRESS: 4/32

OC  
Card 2/2

LIVANOV, V.A.; BUKHANOVA, A.A.; KOLACHEV, B.A.; NEVEROVA-SKOBLEVA, N.P.;  
SLAVINA, I.I.; SHEYNIN, E. Ye.; SHCHERBINA, L.V.

Effect of hydrogen on the mechanical properties of titanium and  
the O14-1 alloy. Izv. vys. ucheb. zav.; tsvet. met. 7 no. 4:  
124-129 '64 (MIRA 19:1)

1. Moskovskiy aviatsionnyy tekhnologicheskii institut, kafedra  
metallovedeniya i tekhnologii termicheskoy obrabotki.

KOLACHIN, B.A.; ILVANCY, V.I.; BUKHANOVA, A.A.; GUSEL'NIKOV, V.Ya.

Effect of the rate of cooling on the tendency of  $\alpha$ -titanium alloys toward hydrogen brittleness. Izv.vys.ucheb.zav., tsvet.met. 8 no.2:131-135 '65. (MIR 1961)

1. Kafedra metallovedeniya i termicheskoy obrabotki Moskovskogo aviatsionnogo tekhnologicheskogo instituta. Submitted January 3, 1964.



L 38552-66 ENT(m)/ENP(k)/T/ENP(w)/ENP(t)/ETI IJP(c) GD/JD/HW  
 ACC NR: AT6012393 SOURCE CODE: UR/0000/65/000/000/0212/0220

AUTHORS: Kolachev, B. A.; Livanov, V. A.; Gusel'nikov, N. Ya.; Bukhanova, A. A.

ORG: none

TITLE: On certain general principles of the occurrence of hydrogen brittleness in alloys VT3-1 and VT15

SOURCE: Soveshchaniye po metallokhimii, metallovedeniyu i primeneniyu titana i yego splavov, 6th. Novyye issledovaniya titanovykh splavov (New research on titanium alloys); trudy soveshchaniya. Moscow, Izd-vo Nauka, 1965, 212-220

PHASE COMPOSITION  
 TOPIC TAGS: crack propagation, titanium containing alloy, alloy, martensite alloy, material deformation, hydrogen embrittlement / VT3-1 martensite alloy, VT15 alloy

ABSTRACT: A review is made of certain principles of hydrogen brittleness in alloys VT3-1 and VT15. The brittleness of  $(\alpha + \beta)$ -titanium alloy VT3-1 is more intense at temperatures below room temperature and at low rates of deformation.  $\beta$ -titanium alloys at lower-than-room temperatures also tend toward hydrogen brittleness. The temperature of the occurrence of hydrogen brittleness decreases with increasing hydrogen content. Hydrogen brittleness of alloy VT15 occurs only at low rates of deformation in a narrow temperature interval from -30 to 100. The brittleness of  $(\alpha + \beta)$ -titanium alloys depends upon processes occurring in the  $\beta$ -phase during

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I. 38552-66

ACC NR: AT6012393

16 plastic deformation. Since the  $\beta$ -phase content in alloy VT3-1 is, after isothermal annealing, similar to that in alloy VT15, the hydrogen brittleness in each develops in the same pattern under identical conditions of mechanical testing. The dislocation theory satisfactorily describes the brittleness phenomenon. The dislocations transport hydrogen to the edges of the grain, thus causing segregations of hydrogen leading to formation and propagation of cracks. The microscopic nature of crack formation and how hydrogen segregation serves to prevent plastic deformation at the tip of cracks are discussed. Orig. art. has: 8 figures.

SUB CODE: 11/18

SUBM DATE: 02Dec65/

ORIG REF: 008/

OTH REF: 010

Card 2/2

L 40237-66 EWT(1)/EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6019642

SOURCE CODE: UR/0149/66/000/003/0094/0102

AUTHOR: Kolachev, B. A.; Livanov, V. A.; Bukhanova, A. A. 27  
C

ORG: Department of Metallography and Thermal Processing, Moscow Aviation Technological Institute (Moskovskiy aviatsionnyy tekhnologicheskii institut. Kafedra metallovedeniya i termootrabotki)

TITLE: Phase diagram of the system titanium-oxygen-hydrogen 21 21 21

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 3, 1966, 94-102

TOPIC TAGS: titanium compound, oxygen compound, hydrogen compound, phase diagram

ABSTRACT: The isotherms of the equilibrium pressure of hydrogen in the system Ti-O-H were plotted at temperatures of 700 and 800C. Oxygen was found to increase the equilibrium pressure of hydrogen in the system, especially at a content of more than 5 wt. %. The isotherms have sharp bends corresponding to the transition from one phase region to another which permits finding the boundaries of all phase regions of the system in the investigated concentration range of oxygen and hydrogen except the interface between the  $\alpha + \beta$  - and  $\beta$  - regions. Isobars of the equilibrium pressure of hydrogen in the system were plotted at 700 and 800C, from which the position of the conodes in the two-phase region and the boundary between the  $\alpha + \beta$  - and  $\beta$  -regions were established. The isothermal cross sections of the

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UDC: 620.181.663.295'546.21'546.11

L 40237-66

ACC NR: AP6019642

phase diagram of the system were plotted at 700 and 800C from the isotherms and isobars of the hydrogen equilibrium pressure. It is shown that the heat of solution of hydrogen in the  $\alpha$ -phase is virtually independent of the oxygen content up to 3 wt. % and amounts to about 22,400 cal/mole. At higher oxygen contents the heat of solution of hydrogen in the  $\alpha$ -phase increases (with consideration of the sign) and amounts to 17,200 cal/mole at 10.10 wt. %  $O_2$ . Orig. art. has: 1 table and 7 figures.

SUB CODE: 07J/ SUBM DATE: 03Mar65/ ORIG REF: 004/ OTH REF: 011

Card 2/2 *JD*

L 100-3-57 EMT(m)/EMP(w)/EMP(t)/ETI LJP(c) 33/JH  
 ACC NR: AP6029676 (A) SOURCE CODE: UR/0136/66/000/002/0022/0090

AUTHORS: Kolachev, B. A.; Livanov, V. A.; Drozdov, P. D.; Bukhanova, A. A.

ORG: none

TITLE: Mechanical properties of alloy MA2-1 containing different concentrations of hydrogen

SOURCE: Tsvetnyye metally, no. 8, 1966, 88-90

TOPIC TAGS: magnesium alloy, hydrogen, hydrogen embrittlement / MA2-1 magnesium alloy

ABSTRACT: The mechanical properties of the alloy MA2-1 were determined as a function of its hydrogen content. The investigation was initiated to corroborate a mechanism for hydrogen embrittlement in metals, as proposed by B. A. Kolachev, V. A. Livanov, A. A. Bukhanova, and N. Ya. Gusel'nikov (Novyye issledovaniya titanovykh splavov. Izd. Nauka, 1965 s. 212). The mechanical properties of the specimens were ascertained after annealing in air and in vacuum at 300C for 10 hours. The hydrogen content of the specimens, determined after A. P. Gudchenko and A. K. Leont'yev (Sb. Trudy MATI, 1961, vyp. 49, s. 137), was 18 cm<sup>3</sup> and 9 cm<sup>3</sup> per 100 g respectively. The experimental results are presented graphically (see Fig. 1). It was found that these results agree with the proposed dislocation hypothesis of hydrogen embrittlement.

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UDC: 669.715:620.1

L 10683-67

ACC NR: AP6029676

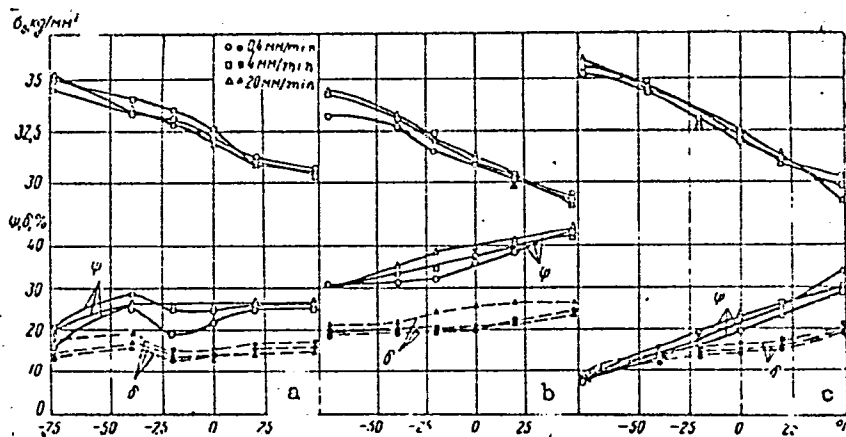


Fig. 1. Influence of the experimental temperature on the mechanical properties of alloy MA2-1: a - hot-pressed state; b - after vacuum annealing at 300C for 10 hours; c - after air annealing at 300C for 10 hours

Orig. art. has: 3 graphs.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 003/ OTH REF: 001

2/2

ACC NR: AT6036416

SOURCE CODE: UR/2536/66/000/066/0076/0086

AUTHOR: Kolachev, B. A. (Candidate of technical sciences); Bukhanova, A. A. (Candidate of technical sciences); Livanov, V. A. (Doctor of technical sciences, Professor)

ORG: none

TITLE: Phase distribution of hydrogen in ( $\alpha$  +  $\beta$ ) titanium alloys

SOURCE: Moscow. Aviatsionnyy tekhnologicheskii institut. Trudy, no. 66, 1966. Struktura i svoystva aviatsionnykh staley i splavov (Structure and properties of aircraft steels and alloys), 76-86

TOPIC TAGS: *TEMPERATURE DEPENDENCE,*  
titanium alloy, hydrogen, phase composition / VT6 titanium alloy

ABSTRACT: While it is known (Livanov, V. A., Bukhanova, A. A., Kolachev, B. A. Vodorod v titane, Metallurgizdat, 1962) that hydrogen in ( $\alpha$  +  $\beta$ ) Ti alloys concentrates in the  $\beta$ -phase, the temperature dependence of the phase distribution of hydrogen still has not been established. Accordingly, the authors investigated the interaction between hydrogen and  $\alpha$ - and  $\beta$ -phases of ( $\alpha$  +  $\beta$ ) Ti alloys (the alloys Ti + 0.5% Mo and Ti + 12.5% Mo, representing the  $\alpha$ - and  $\beta$ -phases of the Ti-Mo system in an equilibrium at 800°C, and the alloys Ti + 8% Al + 2% V and Ti + 4% Al + 6% V, representing the  $\alpha$ - and  $\beta$ -phases of the industrial alloy VT6

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UDC: 669.017:669.295

ACC NR: AT6036416

(Ti + 6% Al + 4% V) in an equilibrium at 900-925°C) at various temperatures. Hydrogen was added in small portions to the vacuum-annealed alloy specimens, each succeeding portion being introduced only after the equilibrium pressure due to the addition of the preceding portion had set in. The amount of the hydrogen absorbed by the specimen was determined according to the pressure difference in the system. Findings: in the two-phase region hydrogen is nonuniformly distributed between the phases. The ratio between hydrogen concentrations in the  $\beta$ - and  $\alpha$ -phases is determined by the entropic factors and by the heats of dissolution of hydrogen in the phases. At low temperatures in ( $\alpha + \beta$ ) Ti alloys hydrogen gets concentrated in the  $\beta$ -phase, since the thermal effect of the dissolution of hydrogen in this phase (taking polarity into account) is smaller than in the  $\alpha$ -phase. At temperatures of the order of 800-900°C hydrogen satisfactorily dissolves in the  $\beta$ - and  $\alpha$ -phases; the hydrogen concentration in the  $\beta$ -phase of the Ti-Mo and Ti-Al-V systems is only 1.3-1.4 times as high as in the  $\alpha$ -phase. As the temperature decreases hydrogen migrates from the  $\alpha$ -phase to the  $\beta$ -phase until the hydrogen concentration ratio between these phases  $C_\beta/C_\alpha$  increase to several tens. The thermodynamic analysis of the solutions of hydrogen in  $\alpha$ - and  $\beta$ -phases of Ti alloys applies to any two-phase system. Thus, hydrogen concentrations in the  $\alpha$ - and  $\beta$ -phases of ( $\alpha + \beta$ ) Ti alloys are similar at high temperatures, and it is only at sufficiently low temperatures that hydrogen concentrates in the  $\beta$ -phase. It follows hence that the proneness of ( $\alpha + \beta$ ) Ti alloys to hydrogen brittleness must markedly depend on the test temperature and on the previous heat treat-

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ACC NR: AT6036416

ment. The different solubility of hydrogen in different phases may be utilized for the internal degassing of one of the phases at the expense of the other. This method may greatly improve the plasticity of refractory metals which, as a rule, have bcc lattices and thus are particularly susceptible to contamination by interstitial impurities. The same principle can be utilized for the degassing of molten metals by means of substances which do not (or nearly do not) interact with these metals but have a great affinity for hydrogen. If, say, titanium is added to molten aluminum, hydrogen from the melt will migrate to the titanium. Orig. art. has: 7 figures.

SUB CODE: 11 / SUBM DATE: none/ ORIG REF: 006/ OTH REF: 001

Card 3/3

ACC NR: AT6036418

SOURCE CODE: UR/2536/66/000/066/0096/0102

AUTHOR: Kolachev, B. A. (Candidate of technical sciences); Livanov, V. A. (Doctor of technical sciences, Professor); Bekhanova, A. A. (Candidate of technical sciences); Gusel'nikov, N. Ya. (Engineer)

ORG: none

TITLE: On the abrupt decrease in the plasticity of titanium at high temperatures

SOURCE: Moscow. Aviatsionnyy tekhnologicheskii institut. Trudy, no. 66, 1966. Struktura i svoystva aviatsionnykh staley i splavov (Structure and properties of aircraft steels and alloys), 96-102

TOPIC TAGS: titanium, hydrogen, plasticity, brittleness, strain

ABSTRACT: According to a previous hypothesis by the first three of the authors (B. A. Kolachev et al. Issledovaniye titana i yego splavov, Izd-vo AN SSSR, 1963) the reason for the hydrogen brittleness of a number of metals is that the hydrogen-atom atmospheres forming at the dislocations are entrained by the latter in the presence of low straining rates, so that the hydrogen concentration at the grain boundaries or at other obstacles at which the disloca-

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UDC: 669.017:669.295

ACC NR: AT6036418

tions pile up becomes sufficient for a sharp acceleration of the development and propagation of cracks leading to fracture of the metal. Now the authors show that the hydrogen brittleness developing in the presence of low straining rates manifests itself within a temperature range (300-550°C) which corresponds to a specific value ( $10^{-5}$ - $10^{-6}$  cm<sup>2</sup>/sec) of the diffusion coefficient of hydrogen. In this connection, the authors investigate the effect of hydrogen on the mechanical properties of regular (0.002% H<sub>2</sub>) and vacuum-annealed (0.02 and 0.05% H<sub>2</sub>) rods of technically pure Ti subjected to tensile strength tests at normal (4 mm/min) and low (0.4 mm/min) straining rates. Findings: the minimum elongation per unit length for Ti in the presence of normal straining rate was recorded at 500°C (Fig. 1) while in the presence of the below-normal straining rate (0.4 mm/min) the mechanical properties of the Ti with 0.002% H<sub>2</sub> increase up to a point with increasing temperature whereas those of the Ti with 0.0% H<sub>2</sub> steadily decrease with increasing temperature. These experiments were organized on the assumption that the sharp decrease in the plasticity of Ti at high temperatures is due to hydrogen alone. The experiments revealed, however, that this sharp decrease in plasticity within the temperature range of 300-550°C also occurs in technically pure Ti (0.002% H<sub>2</sub>) -- not as distinctly as in the Ti containing 0.05% H<sub>2</sub> but still distinctly enough. This sharp decrease is apparently due to the presence of O<sub>2</sub> and N<sub>2</sub> and resembles similar phenomena discovered

Cord 2/3

ACC NR: AT6036418

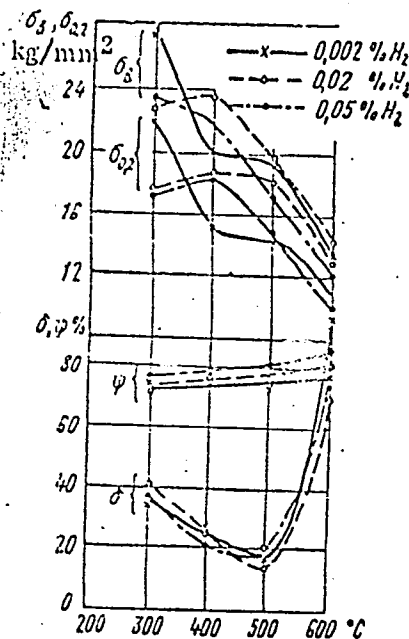


Fig. 1. Effect of temperature on mechanical properties of Ti containing various proportions of  $H_2$  in the presence of a low straining rate.

in Nb, V and other metals. In the presence of hydrogen (0.05%  $H_2$ ) the decrease in elongation at 400-500°C at low straining rates is compounded by the hydrogen brittleness due to the transport of hydrogen toward the grain boundaries. The effect of hydrogen on the properties of titanium within this temperature range is similar to the effect of strain aging. Orig. art. has: 5 figures.

SUB CODE: 11 / SUBM DATE: none  
ORIG REF: 003/ OTH REF: 002

Cord 3/3

ACC NR: AP7002867

SOURCE CODE: UR/0149/66/000/006/0142/0145

AUTHOR: Kolachev, B.A.; Livanov, V.A.; Bukhanova, A.A.; Gusel'nikov, N. Ya.; Lyasotskaya, V.S.

ORG: Department of Metal Science and Technology of Thermal Processing of Metals, Moscow Aviation Technology Institute (Moskovskiy aviatsionnyy tekhnologicheskii institut, kafedra metallovedeniya i tekhnologii termicheskoy obrabotki metallov)  
TITLE: Effect of hydrogen on the structure and properties of variously heat-treated VT3-1 alloy

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 6, 1966, 142-145

TOPIC TAGS: hydrogen embrittlement, ductility, deformation rate, titanium alloy, ~~hydrogen-containing titanium alloy~~, alloy strength, ~~alloy brittleness~~, alloy structure/VT3-1 alloy, ~~alloy ductility~~

ABSTRACT: Hydrogen-induced embrittlement of VT3-1 and other  $\alpha + \beta$  titanium alloys depends not only on the hydrogen content, but to a considerable extent on the content of other impurities, heat treatment, grain size and the type and conditions of deformation. To determine the effect of the various factors, several series of specimens of modified (with increased Al, Fe and Si content) VT3-1 [U.S. T1 155A] titanium alloy with a hydrogen content of up to 0.1 wt.% were annealed at 800C and slowly cooled, or annealed at 840 or 970C, quenched, aged at 550C for 0.5-3 hr. and then

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UDC: 669.018.1

ACC NR: AP7002867

subjected to tension tests at a deformation rate of 0.4—4.0 mm/min. In the alloy annealed and slowly cooled, a hydrogen content of up to 0.1% had no significant effect on the ductility of the alloy at a deformation rate as low as 0.4 mm/min, while in the as-quenched alloy deformed at the same rate, a substantial decrease in the reduction of area occurred at a hydrogen content of 0.003% H<sub>2</sub>. However, at a strain rate of 4 mm/min, no noticeable change in the reduction of area was observed in as-quenched alloys containing up to 0.05% H<sub>2</sub>. The brittleness of as-quenched alloy increased with increasing annealing temperature, since this decreased the amount of residual  $\alpha$ -phase and increased the amount of the  $\alpha$ -phase. An especially strong effect of hydrogen was observed in aged VT3-1 alloy. Short (0.5 hr) aging at 550C significantly increased the tensile and yield strengths of the alloy containing 0.03 and 0.05% hydrogen and sharply decreased the elongation and reduction of area. The alloy strength decreased and ductility increased with increasing aging time from 0.5 to 3 hr, but changed only slightly with still longer aging.

[WA-88]

[MS]

SUB CODE: 11, 13/ SUBM DATE: 27Apr65/ ORIG REF: 005/ OTH REF: 001  
ATD PRESS: 5114

Card 2/2

NOVIKOV, V.A.; BUKHANOVA, A.I.

Use of thermal processing for separating certain minerals. Kora  
vyvetr. no.2:402-408 '56. (MLRA 9:8)  
(Ilmenite)

PROKOF'YEVA, I.V.; BUKANOVA, A.Ye.

Formamidine-sulfinic acid in the analytical chemistry of  
platinum metals. Report 2: Separation of rhodium and iridium.  
Zhur.anal.khim. 20-no.5:598-602 '65.

(MIRA 18:12)

1. Institut obshchey i neorganicheskoy khimii imeni N.S.  
Kurnakova AN SSSR, Moskva. Submitted March 6, 1964.



1ST AND 2ND COLUMNS										3RD AND 4TH COLUMNS									
MATERIALS INDEX										COMMON VARIETIES INDEX									
ASB-LLA DETALLURGICAL LITERATURE CLASSIFICATION										1ST AND 2ND COLUMNS									
3RD AND 4TH COLUMNS										1ST AND 2ND COLUMNS									
<p><b>BURHANDVA, G.A.</b></p> <p><b>B</b></p> <p><b>26</b></p> <p><b>Ternary Systems of Fluorides and Chlorides of Lithium and Calcium. (In Russian.) G. A. Burhandva and A. G. Bergman. Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 67-70.</b></p> <p>Data on the above are tabulated, charted, and discussed.</p>																			

ALEKSANDROV, B.F.---(continued) Card 2.

BELYAYEV, V.S., inzh., red.; BUKHANOVA, L.I., inzh., red.; VLASOV, V.M., inzh., red.; GLADILIN, L.V., prof., doktor tekhn.nauk, red.; GREBTSOV, N.V., inzh., red.; GRECHISHKIN, F.G., inzh., red.; GONCHAREVICH, I.F., kand.tekhn.nauk, red.; GUDALOV, V.P., kand.tekhn.nauk, red.; IGNATOV, N.N., inzh., red.; LOMAKIN, S.M., dotsent, kand.tekhn.nauk, red.; MARTYNOV, M.V., dotsent, kand.tekhn.nauk, red.; POVOLOTSKIY, I.A., inzh., red.; SVETLICHNYY, P.L., inzh., red.; SAL'TSEVICH, L.A., kand.tekhn.nauk, red.; SPERANTOV, A.V., kand.tekhn.nauk, red.; SHETLER, G.A., inzh., red.; ABARBARCHUK, F.I., red.izd-va; PROZOROVSKAYA, V.L., tekhn.red.; KONDRAT'YEVA, M.A., tekhn.red.

[Mining; an encyclopedic handbook] Gornoe delo; entsiklopedicheskiy spravochnik. Glav.red.A.M.Terpigorev. Chleny glav.redaktsii A.I. Baranov i dr. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po gornomu delu. Vol.7. [Mining machinery] Gornye mashiny. Redkol.toma A.V.Topchiev i dr. 1959. 638 p. (Mining machinery) (MIRA 13:1)

S/138/60/000/010/007/008  
A051/A029

AUTHORS: Zuyev, Yu.S., Bukhanova, N.N., Dorfman, T.I.

TITLE: An Automatic Instrument for the Investigation of Creep and Static Fatigue of High Polymers Under a Constant Tension

PERIODICAL: Kauchuk i Rezina, 1960, No 10, pp.44-45

TEXT: Instruments for testing the deformation of high polymers under a constant tension of either expansion or compression, designed both in the USSR and abroad, are classified into four groups according to their design: 1) Devices in the form of a shaped load submerged into the liquid with the expansion of the sample (Ref 1,6). 2) Devices changing the direction of the applied force with the expansion of the sample (Ref 3,7,10-12). 3) Lever device of the scale type (Ref 9,13-15). 4) Devices in the shape of an oblique plane (Refs 4,5,8) along which the load moves, which expands the sample (in the expansion of the sample the angle of the inclined plane changes). The shortcomings are listed as follows: the instruments described in Ref. 1,6,7,9-12,15 are designed for a deformation of 50-100%, but the deformation of high-elastic polymers reaches 1,000%. Instruments listed in Ref. 4,5,8,13,14 do not maintain the given tension constant automatically. The "Ulitka" (Ref. 3,7,11,12) is suggested as being the most appropriate in large deformations, where the constant

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An Automatic Instrument for the Investigation of Creep and Static Fatigue of High Polymers Under a Constant Tension

tension is maintained automatically. The shortcomings in this device designed at the Leningradskiy fiziko-tekhnicheskii institut (Leningrad Physico-Technical Institute) are: larger dimensions (0.4 x 0.4 x 1.5 m); the need of each sample for an automatically-recording and thermostatic device. The authors further describe the two design variants which they developed: a compact instrument (40 cm in diameter), where one automatic recorder and one thermostatic device serves four samples in the first variant and eight samples in the second variant. The basic instrument shown in Fig. 1 is described as having a body consisting of an upper (1) and lower (2) disk fastened with metal rods (3). The disk (1) is a panel for the attachment of four working units with the same design and one rod (4) with a platform (5), on which the four lower clamps (6) are placed. Disk (2) serves as the base of the instrument; three spheres are fitted onto the base which enables the instrument to be moved about easily. Stands (7) are fastened to the disk with bearings pressed into them (8). An axle (9) rotates inside the bearings on which the "Ulitka" is attached (10), also a dial graduated in degrees (11), a roller (12) for the counterweight (13) and a flywheel (14). The stress from load (15) suspended from the "Ulitka" is

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An Automatic Instrument for the Investigation of Creep and Static Fatigue of High Polymers Under a Constant Tension

transmitted by the flywheel to a steel band or wire (16) and further through the upper clamp (17) to the sample (18). The lower part of the sample is fastened to the stationary clamp, the initial position of which is regulated by a screw. The samples are placed into the thermostatic container, filled with a specific medium. The system of counterweights is used for maintained the working unit in a state of indifferent equilibrium. The counterweight (19) balances the "Ulitka". The counterweight (13,20) balances the upper clamp and the nib. The recording device consists of an exchangeable drum (21) rotating by means of a clock mechanism or by the motor on the axis which is the continuation of the rod (4) and the nib (22). Drums with different rates of rotation are used depending on the length of the experiment. The "Ulitka"-type is designed for a length of the working rectangular section of the sample equal to the distance between the clamps. Samples in the form of two spades are suggested for use instead of samples of rectangular shape, since the latter tear the clamps when working in the region of large deformations. The authors checked the constancy of the tension during the deformation process using a dynamometer and determined the strength transferred to the sample at various positions of the Ulitka. The results of the check showed that a constant

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An Automatic Instrument for the Investigation of Creep and Static Fatigue of High Polymers Under a Constant Tension.

tension is upheld in the deformation process for the selected form of the samples when using self-tightening clamps. The mean square error in determining the constancy of the tension value produced from loads of 500, 1,000, and 1,500 (up to deformations of about 1,000% on the "Ulitzkas" determined for a distance of 20 mm between the clamps) is equal to 2.2% and from loads of 300, 500 and 700g (to a deformation of about 450% on the "Ulitzkas" determined for a distance of 40 mm between the clamps) 1%. There is one diagram and 15 references: 5 Soviet, 10 English.

ASSOCIATION: Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti  
(Scientific Research Institute of the Rubber Industry).

Card 4/6

S/138/60/000/010/007/008  
A051/A029

An Automatic Instrument for the Investigation of Creep and Static Fatigue of High Polymers Under a Constant Tension

Fig. 1: Diagram of an instrument for the investigation of creep and static fatigue of high polymers:

- 1) upper disk 2) lower disk 3) metal rods 4) rod 5) platform 6) lower clamps 7) stand 8) bearing 9) axle 10) Ulitka 11) scale graduated in degrees 12) roller 13) 19) 20) counterweights 14) flywheel 15) loads 16) steel band 17) upper clamps 18) sample 21) exchangeable drum 22) nib 23) level

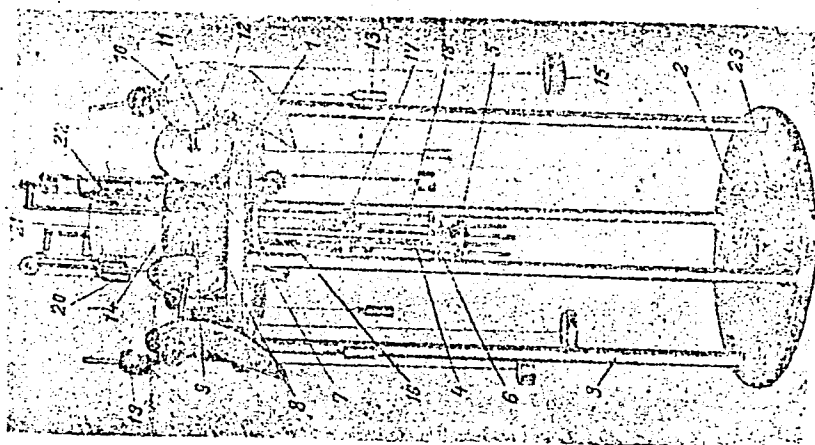
Card 5/6

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A051/A029

An Automatic Instrument for the Investigation of Creep and Static Fatigue of  
High Polymers Under a Constant Tension

Figure 1



Card 6/6



BUKHANOVA, R.S.; MANUYLOV, V.G. (Moscow)

"Magnetic dipole motion in a ionized gas"

report presented at the 2nd All-Union Congress on Theoretical and Applied  
Mechanics, Moscow, 29 January - 5 February 1964

BUKHANOVSKI<sup>y</sup>, I.

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